

## **Materials Science for Advanced Nuclear Energy**

### **Executive Summary**

This proposal is to request support from the U.S. Nuclear Regulatory Commission (NRC) for developing courses in the area of Materials Science for Advanced Nuclear Energy (MANE) at Georgia Institute of Technology (Georgia Tech). The NRC educational grant will be utilized to develop and implement curricula for the two courses named (i) *Materials for Advanced Nuclear Energy I: Nuclear Fuel (MANE I)* and (ii) *Materials for Advanced Nuclear Energy II: Structural Materials (MANE II)*. These courses address the areas of nuclear fuel and structural materials performance under ambient and reactor conditions for future-generation nuclear energy systems. At present such courses do not exist at Georgia Tech. Textbooks that address these subjects are outdated or consider only one aspect of the subject (e.g., Was [2] studies radiation effects in materials in a recent book). Conceptually, the two courses are structured according to the two main classes of materials that are essential to the fuel and reactor assembly. In the course *MANE I*, structure property and processing relationships in nuclear fuels will be studied. In course *MANE II*, the emphasis is on structural materials for cladding as well as in-core and out-of-core structural assembly. The NRC-supported FRAPCON fuel performance code will be used to provide the students valuable hands-on training on fuel performance codes. Both courses are expected to become an integral part of the Georgia Tech Nuclear Engineering curriculum and will provide students with the necessary background to quantitatively analyze materials behavior in nuclear reactors. Given the large size of the Nuclear and Radiological Engineering program at Georgia Tech, this project will have a significant impact in improving the education infrastructure for nuclear engineering in the country.